

STATISTICS 6410  
Spring 2018, TR 9:05 – 10:55

COURSE INFORMATION

**Instructor:** William Notz  
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**Office Hours:** T 11:15-12:30, W 10:00-11:00, Th 12-1, by appointment

**Grader:** Chenggong Han, CH 238

**Text:** *Design and Analysis of Experiments*, 2<sup>nd</sup> Ed. by Angela Dean, Daniel Voss, and Danel Draguljic.

**Room:** UH 0082

**Format:** Lecture

LEARNING OBJECTIVES

- Understand basic principles of good design (randomization, replication, blocking).
- Understand and correctly interpret models for factorial experiments (main effects, interactions).
- Be able to analyze data from factorial experiments, including diagnostics, methods to address model inadequacy, and multiple comparisons.
- Understand the issues involved in determining the sample size for factorial experiments and be able to compute the needed sample size for balanced factorial experiments.
- Understand the difference between fixed and random effects, and be able to analyze mixed models.
- Be able to recognize and analyze data from experiments with some special types of randomization (blocking, split plots)
- Understand the concept of aliasing.
- Be able to design and analyze some basic two-level fractional factorial experiments.
- Be able to use software to design and analyze experimental data.

HOMEWORK and EXAMS

Approximately ten homework assignments will be given during the term. These will be graded by the course grader (a statistics graduate student) and only selected problems graded. If you have questions about how a problem has been graded or if you do not understand a problem, please speak to me. Also, I plan to post solutions on Carmen. Homework will usually be collected on Thursdays.

There will be one midterm exam and a final. All will be in class. The midterm exam will (tentatively) be Thursday March 1. The final exam will be Monday April 30, 8:00-9:45. Problems will be similar to the homework questions you have had, so if you understand the homework, you should be able to do well on the exams.

## HOLIDAYS

Monday January 15 is a holiday (Martin Luther King Day). March 12-16 is Spring break.

## GRADING

Course grades will be based on the following formula

Midterm	25%
Final	30%
Homework	45%

## SOFTWARE

Your textbook emphasizes the use of SAS or R for analyzing data. SAS is a very comprehensive statistical package, although it is nontrivial to learn to use. It is very popular in business and industry, so that learning to use SAS is worthwhile (in fact, some employers look favorably on applicants who are familiar with SAS). SAS is available to Windows users from the Office of Information Technology (see below).

R is also a popular software package, especially among researchers. R is available for free for Unix, Windows, or Macintosh operating systems. Use Google to find the download site. R is not menu driven and so takes some effort to learn. One of the weakest features of R is, unfortunately, using it to design and analyze designed experiments. However, your book discusses how to use R. Also, you can find information about downloading the software and getting started online.

I will tend to emphasize the use of the JMP software package. It is menu driven and has several nice features for the design and analysis of experiments. It is produced by SAS. One advantage for OSU users is that you can get a Windows or Macintosh version for free from the Office of Information Technology (see below).

Another popular software package is Minitab. Minitab has a menu driven interface and is a bit easier to use than JMP. Unfortunately, Minitab runs only on Windows machines and is only available to faculty and regular staff through OSU. Minitab can be rented for a nominal fee – for information see <http://www.minitab.com/en-us/academic/>

For information about site-licensed software, see the OIT web site at <https://ocio.osu.edu/software>

I believe Thompson Library has computers available for public use. I suspect that these have SAS, Minitab, and JMP on them, but check with the library.

## TENTATIVE SYLLABUS

Topic	Chapters in the text	Week
Review (testing, confidence intervals, introduction to software)		1
General principles	1, 2	1, 2
<b>ONE-WAY ANALYSIS OF VARIANCE</b>		
Completely randomized designs		2
One Way Analysis of Variance	3.1-3.5	3
Choosing sample size and power	3.6	4
Tests and confidence intervals for contrasts	4.1-4.3	4, 5
Multiple comparisons	4.4	5
Checking model assumptions	5	6, 7
<b>MULTIFACTOR ANALYSIS OF VARIANCE</b>		
Model	6.1-6.3, 7.1-7.2	7
Analysis of the complete model	6.4	8
Midterm Exam March 1		
Analysis of the complete model	7.3-7.4	9
Using software	6.8, 6.9, 7.6, 7.7	9
Choosing sample sizes	6.6	10
Multiple Comparisons	6.3-6.4, 7.3-7.4	10
Diagnostics	6.2.3	11
Single replicate experiments	6.7, 7.5	11
Nested and Mixed models	17, 18	12, 13
<b>BLOCK DESIGNS and SPLIT PLOTS</b>		
Randomized block designs and analysis	10	13
Simple split plots designs and analysis	19.1-19.3	14
<b>FACTORIAL EXPERIMENTS</b>		
Confounding in single replicate experiments	13.1-13.6, 13.8	14
Fractional factorials	15.2	15

Final Monday April 30, 8:00 – 9:45, UH 0082

## **Additional information.**

### Academic misconduct statement

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

### Disability services statement

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; [slds.osu.edu](http://slds.osu.edu); 098 Baker Hall, 113 W. 12<sup>th</sup> Avenue.

### Mental health statement

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student’s ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life’s Counseling and Consultation Service (CCS) by visiting [ccs.osu.edu](http://ccs.osu.edu) or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at [suicidepreventionlifeline.org](http://suicidepreventionlifeline.org).